Arizona Department of Transportation

Intermodal Transportation Division
Roadway Engineering Group

MEMORANDUM

To: See Distribution List	**Date:** 6 November 2006
From: Chris Cooper Roadway Design Section Manager	**Subject:** Crash Cushion Selection Procedure

The Arizona Division of the Federal Highway Administration has issued a Finding in the Public Interest (FIPI), affecting federal-aid projects, allowing the Smart Cushion (model SCI 100 GM) impact attenuator at high-speed, high-crash frequency locations in Arizona under a sole-source specification.

The attached SMART CUSHION site evaluation procedure is for all projects with new crash attenuators or where crash attenuators are being evaluated for replacement. Project managers should insure the procedure is followed.

Please distribute this memo to all design and development personnel, including consultants, within your district, group, or section.

Please direct questions regarding this memorandum to Kenneth Cooper, Roadway Standards Engineer, at 602-712-8674.

JCC/KRC/krc
attachment

c: Roadway Engineering Group
Valley Project Management Group
Statewide Project Management Group
Districts (10)
Bridge Group
Construction Group
FHWA
Dan Lance
Sam Maroufkhani
Traffic Engineering Group
Engineering Consultant Section
Local Government Section
District Permits Office (9)
Central Maintenance Group
Contracts and Specifications Section
Mary Viparina
Doug Forstie
Regional Traffic Engineers (4)

SMART CUSHION SELECTION PROCEDURE
ROADWAY ENGINEERING GROUP
6 November 2006

Guidance: This procedure is a supplement to the *Crash Cushion Selection Procedure* dated October 31, 2002 and applies to federal aid and non-federal aid projects.

The Arizona Division of the Federal Highway Administration approved a Finding in the Public Interest allowing designers to specify the SMART CUSHION impact attenuator, (model SCI 100 GM), a NCHRP Report 350, Test Level 3 device, at high-speed, high-crash frequency locations on federal-aid projects (copy attached). Typical potential locations include, but are not limited to, the following:

- Freeway to freeway system interchanges
- Freeway off-ramps in the Phoenix and Tucson metropolitan areas

At locations not meeting the high-speed, high-crash frequency criteria designers should follow the *Crash Cushion Selection Procedure*. That procedure is on the Roadway Design website under the Design Memorandums heading.

Procedure:

1. Evaluate **and document** the site for compliance with the criteria for a high-speed, high crash-frequency location:

Existing Location:

A. Speed: posted or 85th percentile speeds greater than 45 mph; and
B. Crash Frequency: three or more documented vehicle/impact attenuator collisions within any 36-month period. **Documentation refers to Department of Public Safety or police reports, not maintenance repair records.**

OR

New Location (where there is not a crash history to base a decision on): similar site geometry or conditions as for existing locations, above.

2. Review manufacturer's website for design requirements or contact Work Area Protection Corp., PO Box 4087, St. Charles, IL 60174-9081, telephone: 800-327-4417 for design assistance, if needed.

3. Review site conditions for conformance to manufacturer's requirements.

4. Consult with the District Engineer or District Maintenance Engineer and get their concurrence to use the SMART CUSHION within the district.

5. Provide plan details and special provisions, as needed.

U.S.Department
of Transportation
Federal Highway Administration

Arizona Division
400 East Van Buren Street
One Arizona Center Suite 410
Phoenix, Arizona 85004-0674

August 25, 2006

In Reply Refer To: HOP-AZ
807

Ms. Mary Viparina, Assistant State Engineer
Roadway Design Group, MD 611E
Arizona Department of Transportation
Phoenix, Arizona 85007

Dear Ms. Viparina:

We have reviewed the Arizona Department of Transportation (ADOT) request for a finding in the public interest (FIPI) to specify the use of SMART CUSHION – 100GM impact attenuator manufactured by SCI Products, Inc. We agree that it is in the public interest to specify SMART CUSHION for use in the circumstances delineated below. Accordingly, this impact attenuator is approved for use on Federal-Aid construction projects for a five year period and the criteria used to identify locations will be evaluated after a two year period; both effective from the date of this letter. We concur with how the criteria is defined in your July 18, 2006 request letter and Ken Cooper's August 21, 2006 e-mail which states that high speed, high crash-frequency locations are:

1. Facilities with posted or 85th percentile speeds greater than 45 miles per hour; **and**
2. Three or more documented vehicle/impact attenuator collisions in any 36-month period; **or**
3. For new construction or alterations where there is not history to base a decision on, there are similar site geometry or conditions as locations, meeting Criteria 2, above.

In the request letter, you had provided several justifications for the use of SMART CUSHION including: (1) unique stopping ability, (2) reduced life-cycle cost, and (3) reduced crash-exposure risk to workers and traveling public. We support these justifications because they are based on tangible, quantifiable benefits. The details of the justifications are summarized as follows:

(1) Unique Stopping Ability: The three-part energy absorption mechanics uses a metered-ports, shock absorbing hydraulic cylinder that allows for the device to adjust the resistive force necessary to collapse it as a function of the impacting vehicle's speed. The reduced longitudinal acceleration force on the occupants lessens their chance of injury.

(2) Reduced Life-Cycle Costs: As indicated by the ADOT impact attenuator life cycle cost analysis included in your request letter, its life-cycle cost is about half the amount of impact attenuators used by ADOT. The SMART CUSHION has a projected 10-year cost (3 collisions/year) of $105K

where the other approved impact attenuators have actual/projected costs between $192K and $315K.

(3) Reduced Crash-Exposure Risk: The average repair time is faster than similar impact attenuators, therefore, there is a reduced crash-exposure risk to both maintenance workers and the traveling public. As stated in the request letter, the anticipated repair time for most of the repairs is less than one person-hour for a two-person crew.

In summary, we approve the FIPI request for the use of SMART CUSHION at high speed, high crash-frequency locations as defined previously. As stated earlier, this approval is for a five year period with the understanding that the criteria used to identify locations will be evaluated and/or updated in two years. After the five year approval period, ADOT will need to request approval in a similar manner for continued usage of SMART CUSHION. We understand and are pleased to know that ADOT will continue to monitor and evaluate the market for impact attenuators through the ADOT PRIDE Program and Approved Product List.

Sincerely yours,

KENNETH H. DAVIS

Kenneth H. Davis
Senior Engineering Manager

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